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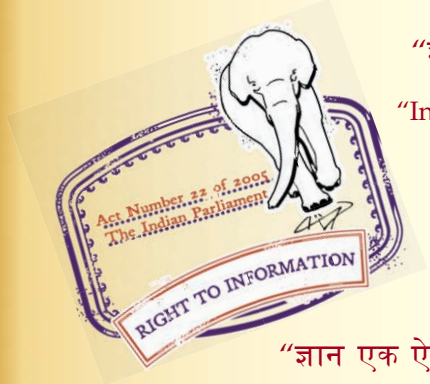

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SPECIFICATION FOR METAL-CLAD BASE MATERIAL FOR PRINTED CIRCUITS FOR USE IN ELECTRONIC AND TELECOMMUNICATION EQUIPMENT

PART II PAPER PHENOLIC COPPER-CLAD LAMINATED SHEET—PF-CP-CU ECONOMIC GRADE

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PART II PAPER PHENOLIC COPPER-CLAD LAMINATED SHEET—PF-CP-CU ECONOMIC GRADE

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SPECIFICATION FOR METAL-CLAD BASE MATERIAL FOR PRINTED CIRCUITS FOR USE IN ELECTRONIC AND TELECOMMUNICATION EQUIPMENT

PART II PAPER PHENOLIC COPPER-CLAD LAMINATED SHEET—PF-CP-CU ECONOMIC GRADE

0. FOREWORD

0.1 This Indian Standard (Part II) was adopted by the Indian Standards Institution on 12 March 1973, after the draft finalized by the Electromechanical Components for Electronic Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 The object of this standard is to specify uniform requirements of mechanical, electrical and climatic properties of paper phenolic copper-clad laminated sheets, economic grade with non-defined high frequency applications, such as domestic radio receivers and allied equipment.

0.3 This standard is to be used in conjunction with IS:5921 (Part I)-1970* which is a necessary adjunct to this standard.

0.4 While preparing this standard, assistance has been derived from the following documents:

ISO/R 62(1958) Plastics: Determination of water absorption (Amendment No. 1). International Organization for Standardization.

IEC Pub 249-2 Metal-clad base materials for printed circuits: Part 2 Specifications. International Electrotechnical Commission.

Doc: B. S. 70/9525 Metal-clad base materials for printed circuits: Parts 2-8 Specifications (Revision of BS 3888:1965). British Standards Institution.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated,

*Specification for metal-clad base material for printed circuits for use in electronic and telecommunication equipment: Part I General requirements and tests.

expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part II) specifies the requirements for paper phenolic copper-clad laminated sheet, economic grade for use in printed wiring in telecommunication and allied electronic equipment.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions of terms given in IS:1885 (Part VI)-1965† and IS:5921 (Part I)-1970‡ shall apply.

3. MATERIALS, CONSTRUCTION AND WORKMANSHIP

3.1 Materials and Construction — The sheet shall consist of an insulating base with copper foil bonded to one or both the sides.

3.1.1 *Insulating Base* — It shall be phenolic resin bonded paper laminate.

3.1.2 *Copper* — Copper used shall conform to **5.3.2** of IS:5921 (Part I)-1970‡ as well as to requirements specified in Table 1.

TABLE 1 MASS AND THICKNESS OF COPPER

Nominal Mass per Unit Area	Deviation	Nominal Thickness	Deviation for Thickness of the Foil at any Point
(1)	(2)	(3)	(4)
g/m²	percent	μm	μm
305	±15	35	+10 − 5
610	±15	70	+18 − 8

3.1.3 Measurements to determine that the foil meets the requirements given in **3.1.2** shall be made in accordance with **5.3.2** of IS:5921 (Part I)-1970‡.

NOTE — The minimum purity of copper should be 99·5 percent and its minimum conductivity should be 95 percent of the value equivalent to a resistivity of $1{\cdot}7241 \times 10^{-8}\Omega$m at 20°C. This is for information only.

*Rules for rounding off numerical values (*revised*).

†Electrotechnical vocabulary: Part VI Printed circuits.

‡Specification for metal-clad base material for printed circuits for use in electronic and telecommunication equipment: Part I General requirements and tests.

3.2 Workmanship — Provision of 3.2 of IS : 5921 (Part I)-1970* shall apply.

4. MARKING

4.1 The marking shall be in black or in some other colour not to be confused with red colour and shall conform to 4 of IS : 5921 (Part I)-1970*.

NOTE — Red indicates the flame resistant grade.

4.2 The marking shall be printed so as to indicate the machine direction of the filling material.

5. TEST SCHEDULE

5.1 General — The test schedule specifies all the tests and the order in which they shall be carried out as well as the requirements to be met with.

5.2 Classification of Tests — The provision of **5.1** of IS : 5921 (Part I)-1970* shall apply except as modified by **5.2.1.**

5.2.1 *Acceptance Tests* — In addition to the tests specified in **5.1.2** of IS : 5921 (Part I)-1970*, the following tests shall also be carried out as acceptance tests:

a) General examination;
b) Insulation resistance (1 000 MΩ, *Min*);
c) Bow; and
d) Twist.

5.3 Conditions of Tests — The provisions of **5.2** of IS : 5921 (Part I)-1970* shall apply.

5.4 Test Schedule — The test schedule shall be as specified in Table 2.

NOTE 1 — The clause references, conditions of test and requirements specified are applicable for the acceptance tests also.

NOTE 2 — Conditions of test and values for the requirements that are to be specified according to IS : 5921 (Part I)-1970* only are given in col 5 of Table 2. Other conditions and requirements shall be as given in IS : 5921 (Part I)-1970*.

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TABLE 2 TEST SCHEDULE

(*Clause* 5.4)

Sl No.	Test	Ref to Cl No. of IS:5921 (Part I)-1970*	Condition of Test	Requirement
(1)	(2)	(3)	(4)	(5)
i)	General examination	5.3.1	—	*Appearance of the Copper-Clad Face* — The copper-clad face shall be substantially free from blisters, wrinkles, pinholes, deep scratches, pits and resin. Any discolouration or contamination shall be readily removable with hydrochloric acid solution (sp gr 1·02) or with suitable organic solvent
ii)	Length and width	5.3.3.1	—	Under consideration
iii)	Thickness	5.3.3.2	—	The thickness of the sheet, including the metal foil, at any point shall conform to the values given below:

Nominal Thickness	*Tolerance*
mm	mm
0·5	±0·07
0·8	±0·09
†1·0	±0·11
†1·2	±0·12
1·6	±0·14
†2·0	±0·15
2·4	±0·18
3·2	±0·20
6·4	±0·30

NOTE — For any nominal thickness within the range of 0·5 to 6·4 mm, which is not given above, the tolerance applicable to the thickness shall be that for the next greater nominal thickness given above.

*Specification for metal-clad base material for printed circuits for use in electronic and telecommunication equipment: Part I General requirements and tests.'

†Non-preferred values.

(*Continued*)

TABLE 2 TEST SCHEDULE — *Contd*

Sl No.	Test	Ref to Cl No. of IS:5921 (Part I)-1970*	Condition of Test	Requirement
(1)	(2)	(3)	(4)	(5)
iv)	Bow	5.3.4	—	Shall not exceed the values given by the formula $d\ (L/1000)^2$ mm, where L is the length of the straight edge in mm and d is as given below:

Nominal Thickness mm	*Copper Foil on One Side* d	*Copper Foil on Both Sides* d
Less than 0·8	Not applicable	
0·8 to 1·2	109	55
Above 1·2 to 1·6	55	27
„ 1·6 to 3·2	55	27
„ 3·2 to 6·4	55	15

v)	Twist	5.3.7	—	Shall not exceed the values given by the formula $d\ (L/1000)^2$ mm, where L is the distance in mm between the corner of the sheet not in contact with the horizontal surface and the diagonally opposite corner d as given in the table above
				NOTE — The requirements for bow and twist apply only to sheet sizes as manufactured and to the cut pieces having neither length nor width less than 460 mm.
vi)	Resistance of the foil	5.5.1	—	a) 305 g/m²—3·5 m Ω, *Max* b) 610 g/m²—1·75 m Ω, *Max*
vii)	Surface resistance after damp heat (long term)	5.5.2	—	1 000 M Ω, *Min*
viii)	Volume resistivity after damp heat (long term)	5.5.3	—	5 000 M Ω cm, *Min*

*Specification for metal-clad base material for printed circuits for use in electronic and telecommunication equipment: Part I General requirements and tests.

(*Continued*)

TABLE 2 TEST SCHEDULE — *Contd*

Sl No.	Test	Ref to Cl No. of IS: 5921 (Part I)-1970*	Condition of Test	Requirement
(1)	(2)	(3)	(4)	(5)
ix)	Surface resistance at 100°C	Under consideration	—	100 M Ω, *Min*
x)	Volume resistivity at 100°C	Under consideration	—	1 000 M Ω, *Min*
xi)	Pull-off strength	5.3.9	—	Not less than 50 N
xii)	Peel strength after heat shock	5.3.10.2	Temperature of the bath: 250°C Immersion time: 10 seconds	Not less than 1 N/mm
xiii)	Peel strength after dry heat	5.3.10.3	—	Not less than 1 N/mm
xiv)	Peel strength after exposure to solvent vapour (trichloroethylene)	5.3.10.4	—	Not less than 1 N/mm NOTE — For solvents other than trichlorethylene requirements shall be as agreed between the purchaser and the supplier.
xv)	Blistering after heat shock	5.3.11	5 seconds	No delamination or blistering shall occur
xvi)	Solderability	5.4.8	—	Under consideration
xvii)	Punching quality	5.3.12	—	Under consideration
xviii)	Flammability	5.4.6	—	Not applicable
xix)	Water absorption	5.4.7	—	*Thickness* mm / *Water Absorption Max*, mg (on 50 × 50 mm) 0·8 — 45 1·0 — 50 1·2 — 53 1·6 — 60 2·0 — 68 2·4 — 75 3·2 — 98 6·4 — 120

*Specification for metal-clad base material for printed circuits for use in electronic and telecommunication equipment: Part I General requirements and tests.

(*Continued*)

TABLE 2 TEST SCHEDULE — *Contd*

Sl No.	Test	Ref to Cl No. of IS:5921 (Part I)-1970*	Condition of Test	Requirement		
(1)	(2)	(3)	(4)		(5)	
xx)	Volume permittivity and loss tangent	5.5.9	To be carried out before damp heat cycling test	*Frequency* MHz	*Loss Tangent*	*Volume Permittivity*
				1	0·045	5·8
				10	0·055	5·8
				30	0·060	5·8
	Non-electrical properties of the base material after complete removal of the foil by etching:					
xxi)	Appearance of base material	—	—	The base material shall be substantially free from pits, holes, scratches, porosity and resin inclusions and substantially uniform in colour. A small amount of irgular variation of colour is permissible		
xxii)	Flexural strength	5.4.1	Applicable to sheet not less than 1·6 mm nominal thickness	Not less than 8 000 N/cm²		
xxiii)	Machinability	—	—	The material shall not crack or delaminate during the operation such as drilling, sawing and cutting; the method of which shall be agreed between the manufacturer and the purchaser		

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AMENDMENT NO. 1 OCTOBER 1975

TO

IS:5921(PART II)-1973 SPECIFICATION FOR METAL-CLAD BASE MATERIAL FOR PRINTED CIRCUITS FOR USE IN ELECTRONIC AND TELECOMMUNICATION EQUIPMENT

PART II PAPER PHENOLIC COPPER-CLAD LAMINATED SHEET-PF-CP-CU ECONOMIC GRADE

Alterations

(First cover, pages 1 and 3, title) - Substitute 'Cu' *for* 'CU'.

[*Page 8, Table 2, Sl No. (X), col 5*] - Substitute '1 000 M Ω Cm, *Min*' *for* '1 000 M Ω, *Min*'.

[*Page 10, title of* IS:5921(Part II)-1973] - Substitute 'Cu' *for* 'CU'.

Addendum

(Page 5, clause 5.4, Note 2) - Add the following clause after the Note:

'5.4.1 The insulation resistance test as an acceptance test shall be carried out in accordance with 5.5.10 of IS:5921 (Part I)-1970* without any conditioning specified in the second para of 5.5.10.3 of IS:5921(Part I)-1970*. This test is applicable to the sheets of all thickness.'

(ETDC 37)

Reprography Unit, ISI, New Delhi

AMENDMENT NO. 2 OCTOBER 1977

TO

IS:5921(Part II)-1973 SPECIFICATION FOR METAL-CLAD BASE MATERIAL FOR PRINTED CIRCUITS FOR USE IN ELECTRONIC AND TELECOMMUNICATION EQUIPMENT

PART II - PAPER PHENOLIC COPPER-CLAD LAMINATED SHEET-PF-CP-CU ECONOMIC GRADE

Alterations

(*First cover, pages 1 and 3, sub-title*) - Substitute 'PART II PHENOLIC CELLULOSE PAPER COPPER-CLAD LAMINATED SHEET-PF-CP-Cu ECONOMIC GRADE' *for* 'PART II PAPER PHENOLIC COPPER-CLAD LAMINATED SHEET-PF-CP-CU ECONOMIC GRADE'.

(*Page 4, clause 1.1, line 1*) - Substitute 'phenolic cellulose paper' *for* 'paper phenolic'.

[*Page 7, Table 2, col 5, Note against Sl No. (v), line 5*] - Substitute '450 mm' *for* '460 mm'.

(LTDC 17)

Reprography Unit, ISI, New Delhi